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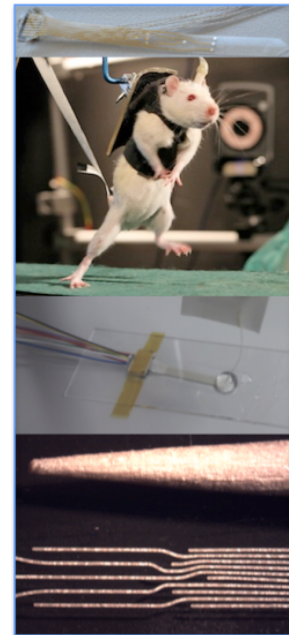


Novel Neuroprosthetics

Fully Stretchable Neuronal Implants For Spinal Cord Stimulation

Project Overview

We are developing high-density stretchable microelectrode arrays (SMEAs) for spinal cord stimulation in spinalised rats [1]. Recent studies demonstrate that epidural spinal cord stimulation in combination with chemical stimulation and rehabilitation training can restore voluntary locomotor movements in spinal cord injured (SCI) rats [2]. For epidural spinal cord stimulation, challenging are the requirements on the electro-mechanical material properties and the fabrication process of the SMEA. In the last decade, significant progress was made towards highly stretchable electronics [3]. Different approaches using metallic thin-films, graphene, nanoparticles, nanowires, carbon nanotubes and conductive polymers are currently investigated for their use in stretchable electronic devices. We develop such composite materials and fabrication methods for stretchable electronics for medical conformal devices as neuronal stimulation & recording and strain sensing.



Join for a semester or master project!

Possible Project Goals

We offer a variety of projects and can tailor it to your personal interests. Possible projects goals could include studying and improving the electromechanical behaviour of elastic conductors for use in neuronal implants and/or strain sensing applications. Testing biocompatibility and long-term stability of our materials and implants. Develop and test our devices for *in vitro* recording of muscle/neuron cell cultures or for measuring brain activity with EEG.

Just drop by my office to discuss possible projects!

Techniques

Most projects will mainly include practical lab work where you can learn a wide variety of techniques from photolithography processing and device fabrication in the cleanroom to electrical and mechanical material characterization techniques. Projects using Matlab or COMSOL Multiphysics simulations are also possible.

Requirements

The abilities to work independently and use your creativity in problem solving are very welcome from the beginning. Otherwise be prepared that you'll learn how to develop them. Students will be required to document their work, write a report/thesis and hold a presentation for the members of the LBB at the end of the project.

Project Type

Semester Project or Master Thesis

Supervisor

Flurin Stauffer

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Professor

Prof. Dr. Janos Vörös

References

1. Larmagnac, A. et al., 2012. Skin-Like PDMS-Based Multi-electrode Array for Epidural Electrical Stimulation to Promote Locomotion in Paralyzed Rats, in IFMBE Proceedings: *5th European Conference of the International Federation for Medical and Biological Engineering*, ed, Ákos Jobbágy, vol. 37, pp. 1180-81.
2. Van den Brand, R. et al., 2012. Restoring voluntary control of locomotion after paralyzing spinal cord injury. *Science (New York, N.Y.)*, 336(6085), pp.1182–5.
3. Someya, T. (ed.), 2012. *Stretchable Electronics*, Wiley-VCH, Weinheim